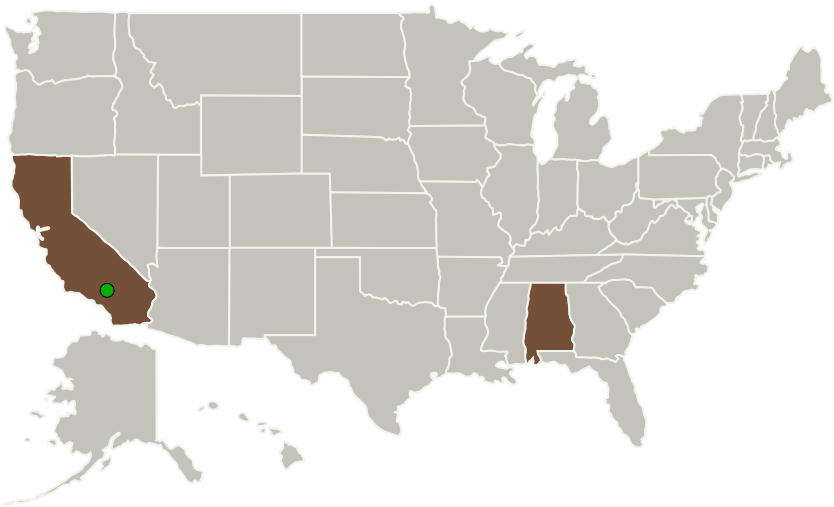
Nonlinear Parameter-Varying AeroServoElastic Reduced Order Model for Aerostructural Sensing and Control, Phase I

Completed Technology Project (2014 - 2014)

Project Introduction

The overall goal of the project is to develop reliable reduced order modeling technologies to automatically generate nonlinear, parameter-varying (PV), aeroservoelastic (ASE) reduced-order models (ROMs) for aerostructural sensing and control. The Phase I effort will focus on developing several key engines, including parameter-varying aerodynamic ROMs (AeroROM), structural dynamics ROM, as well as a scheme to integrate the AeroROM, structural ROM, sensor, actuator, and control law for integrated ASE analysis in the entire flight envelope. A modular software framework will be established for automated data exchange, PV AeroROM and structural ROM generation, ROM integration, computation, and verification. The feasibility of the proposed technology will be demonstrated for several ASE test problems of NASA interest (e.g., Aerostructures Test Wing and X-56A MUTT). The Phase II effort will focus on: (1) ROM engine optimization in terms of functionality, execution efficiency, and automated parameter selection; and (2) software environment enhancements with direct interfacing to NASA-relevant simulation and controller design tools, and fully automated ROM process for technology insertion and transition; and (3) extensive software validation and demonstration for ASE and flight control analysis of realistic aircrafts of current NASA interest.

Primary U.S. Work Locations and Key Partners



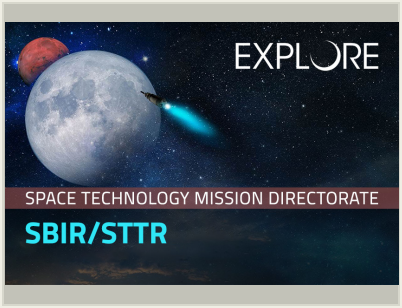


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Table of Contents

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
CFD Research Corporation	Lead Organization	Industry	Huntsville, Alabama
Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California

Primary U.S. Work Locations	
Alabama	California

Project Transitions

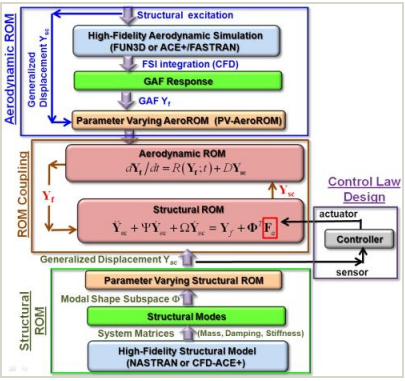
June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140504)*

Images



Briefing Chart
Nonlinear Parameter-Varying AeroServoElastic Reduced Order Model for Aerostructural Sensing and Control, Phase I *(https://techport.nasa.gov/image/127020)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
CFD Research Corporation

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Yi Wang

Co-Investigator:
Yi Wang

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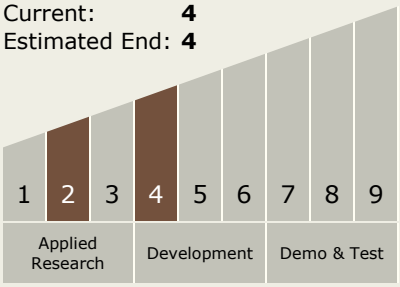
Completed Technology Project (2014 - 2014)

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.2 Modeling
    - TX11.2.4 Science Modeling

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System